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Specification and Drawings, as originally filed, with Application for Patent Serial No: **2,286,891,** on October 15, 1999, by **FANTOM TECHNOLOGIES INC.,** assignee of Wayne Ernest Conrad, for "Method for Reducing the Power Consumption of an Incandescent Light Bulb".

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ABSTRACT OF THE DISCLOSURE

A method and apparatus are provided for controlling the electrical power supply to an incandescent light source or bulb. The method comprises modifying the power supply with a pulse train. Parameters of the pulse train are selected in accordance with an algorithm. At least one parameter, for example frequency, pulse width or voltage, can be selected an optimized to improve the efficiency of the light bulb, whereby greater visible light is produced for a given electrical input.

Title: METHOD FOR REDUCING THE POWER CONSUMPTION OF AN INCANDESCENT LIGHT BULB

FIELD OF THE INVENTION

This invention relates to a method and apparatus for delivering power to an incandescent light bulb. This invention more particularly is concerned with a method and apparatus for powering an incandescent light bulb, to provide greater efficiency.

BACKGROUND OF THE INVENTION

Incandescent light bulbs are a common and much used source of light. With modern technology, incandescent light bulbs are cheap and inexpensive to manufacture. They require no special control circuitry or the like in operation.

Fundamentally, an incandescent light bulb has a filament, usually contained within a glass enclosure, filled with a gas selected to maximize filament life. In use, an electric current is passed through the filament and simply serves to heat the filament to a very high temperature.

The effect of this is to cause the filament to radiate electromagnetic radiation. It is well known that the spectrum of radiation produced is dependent upon the temperature of the filament. The filament is designed to reach temperatures such that a significant proportion of the radiation falls within the visible band of the electromagnetic spectrum. Unfortunately, the electromagnetic spectrum produced by a heated object, such as a filament, is necessarily broad, and much of the radiation falls either in the infrared or ultraviolet bands.

This is highly undesirable. However, conventionally, it has simply been accepted that the physics of radiation or a heated body necessarily determines characteristic. Accordingly, this is simply accepted, and common incandescent light bulbs have a relatively low efficiency.

Commonly, incandescent light bulbs are powered from an electrical, alternating supply. In North America, this is usually a 120 V

supply at a 60 Hz frequency.

SUMMARY OF THE INVENTION

What the present inventor has realized is that it is possible to modulate or modify the signal supplied to an incandescent light bulb, to improve its performance. This modulation can be applied to either an alternating current or a direct current signal.

In effect, it has been discovered that if the power supplied to the light bulb is supplied as a train of pulses, then this can significantly affect the behaviour of the light bulb. More particularly, it has been found that characteristics of a pulse train, such as frequency, pulse width and pulse height, can be selected to optimize the performance of a light bulb.

The exact reasons for this are not well understood. However, it has been found that, with selection of appropriate parameters, the percentage of radiation given out as visible light can be enhanced considerably. In effect, this enables a light bulb to be run at a lower nominal power rating, while producing the same amount of electrical power. This in turn means that less power is wasted as heat, so the light bulb runs cooler.

In accordance with the present invention, there is provided a method of controlling a power supply to an incandescent light source, the method comprising:

(1) providing an electric power supply;

(2) modulating the electric power supply with a pulse train;

(3) supplying the pulse train to the incandescent light source; and

(4) selecting at least one of the frequency, pulse width and voltage of the pulse train, to improve the efficiency of the light bulb source.

In accordance with another aspect of the present invention, there is provided an apparatus for controlling the power supply to an incandescent light bulb, the apparatus comprising:

an input for an electric power supply;

a first electronic control unit connected to the input, for receiving the electric power supply, for generating a pulse train to modulate the power supply and having an output for a power supply modulated by the pulse train; and

a connector means for connection to an electric light bulb and connected to the output of the first electronic control unit for receiving the pulse train.

BRIEF DESCRIPTION OF THE DRAWING FIGURE

For a better understanding of the present invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawing, which shows a preferred embodiment of the present invention, and in which:

Figure 1 is a schematic view of an apparatus in accordance with the present invention; and

Figure 2 is a graph showing an exemplary pulse train over one period.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a voltage source 1 connected to an electronic control unit by wires 3 and 4. The electronic control unit generates a pulse stream or train which is used to modify or condition the power supplied from the voltage source 1.

Commonly, for domestic and industrial applications, the voltage source will be an alternating current source, for example a 120 V, 60 Hz supply as used throughout North America. However, it is equally applicable to a DC source.

The electronic control unit 2 is connected to an incandescent light bulb 5, by wires 6 and 7. The light bulb 5 is shown schematically, and it will be understood by those skilled in the art that, commonly, the wires 6 and 7 will be connected to a fixed, light fixture,

providing a socket into which the light bulb 5 is itself mounted.

The signal supplied to the light bulb 5 is modified by the pulse train, which has characteristics of pulse width, voltage and frequency. At least two of these characteristics or parameters are modified, in accordance with the present invention, and possibly modification of one may be sufficient. Thus, one of the parameters could be held constant and the other two varied. The two varied parameters could be: frequency and voltage; frequency and pulse width; or the pulse width and voltage. Alternatively, all three parameters, namely the frequency, pulse width and voltage can all be modulated and varied, to control the power transferred to the light bulb.

It has been found that, by extensively varying these parameters and monitoring light generated by the bulb 5 in the visible spectrum, an algorithm can be developed, relating these three parameters and the power supplied, to the amount of visible light generated.

It will be appreciated that common incandescent light bulbs have a low efficiency and much of the power supplied results in generation of ultraviolet or infrared radiation. In effect, the heated filament simply generates radiation over a very wide spectrum, resulting in much loss of energy in the spectrum outside of the visible region.

The attached figure 2 shows an exemplary profile of the pulse train or signal provided by the electronic control unit 2. This shows a single period or cycle 20, and it will be understood that this period 20 is repeated to form the continuous signal.

Within the period 20, there are five pulses, indicated at 21, 22, 23, 24, and 25. The pulses are spaced by intervals indicated as λ_1, λ_2, λ_3, λ_4, λ_5. The specific values for these pulses in this example are:

Pulse No.	Voltage	Duration of Pulse (Pulse Width)	Pulse Interval
21	50	10	λ_1=10
22	55	7	λ_2=12
23	60	12	λ_3=8
24	57	9	λ_4=10
25	48	9	λ_5=12

As indicated at the right hand side, at 21', the next period has the same sequence of pulses.

As this table shows, within the period 20, all the parameters of the pulses, namely frequency (i.e. inverse of the pulse interval), pulse width or duration, and pulse height (voltage) are varied. This gives a distinct pulse profile for the period, and this is repeated in following periods. In general, depending on the particular application, it may not be necessary to vary all three parameters, and it may be sufficient to vary just two of them, or even just one of them, with the other(s) being kept constant. Additionally, it will be understood that the absolute magnitude of each of these parameters can vary greatly depending upon the actual application.

Although the mechanism behind the present invention is not fully understood, it is believed that by selection of suitable parameters, a resonance effect is achieved, causing the filament to provide a significantly larger proportion of the radiation in the visible region. This enables, for example, a normally 40-watt bulb to be driven with significantly less than 40 watts of power, and yet still produce the same amount of visible light. The intention is to maitain the filament in a narrow temperature range.

CLAIMS:

1. A method of controlling a power supply to an incandescent light source, the method comprising:

(1) providing an electric power supply;

(2) modulating the electric power supply with a pulse train;

(3) supplying the pulse train to the incandescent light source; and

(4) selecting at least one of the frequency, pulse width and voltage of the pulse train, to improve the efficiency of the light bulb source.

2. An apparatus for controlling the power supply to an incandescent light bulb, the apparatus comprising:

an input for an electric power supply;

a first electronic control unit connected to the input, for receiving the electric power supply, for generating a pulse train to modulate the power supply and having an output for a power supply modulated by the pulse train; and

a connector means for connection to an electric light bulb and connected to the output of the first electronic control unit for receiving the pulse train.

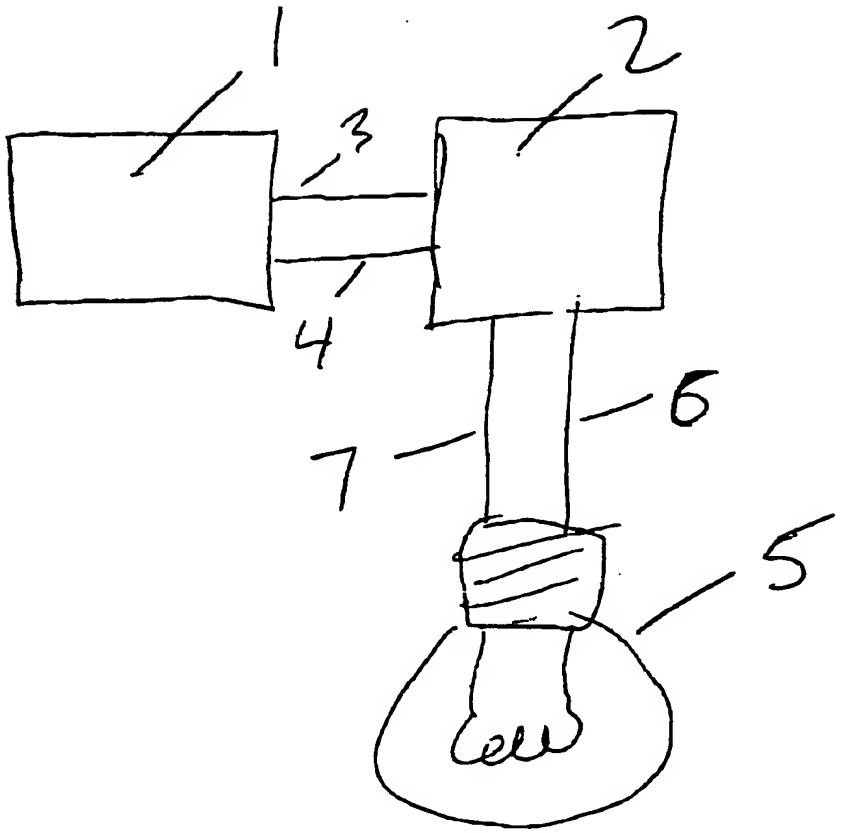

FIGURE 1

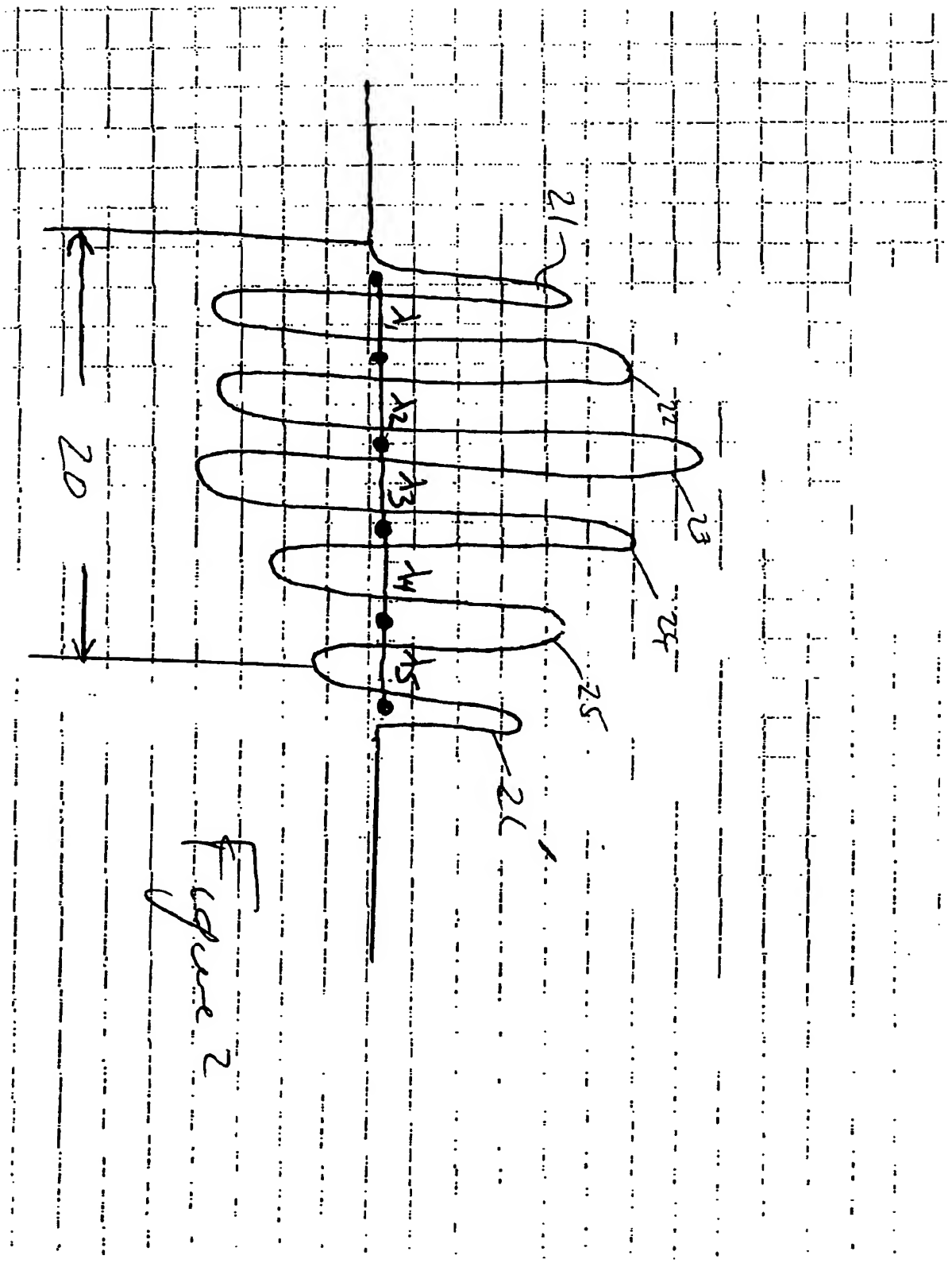

Figure 2